ชื่อเรื่อง **Studies on a Biological Erosion Control System Integrating Tree and Grasses to Manage Degraded Soils of Foot-Hill Himalayas**

ชื่อผู้วิจัย S.S. Grewal and J.S. Samra

ชื่อหน่วยงาน Central Soil and Water Conservation Research Centre, INDIA

ปีที่ดำเนินการ

ปีที่พิมพ์รายงาน

Abstract

Soil erosion is the single largest factor responsible for degrading quality and productivity of land in India. It is estimated that 45% of forest, 56% of farm, 86% of cultivable wastes and 95% of pasture lands suffer from erosion related problems. Though 39 million hectares have since been treated in the last 30 years, but each year area degraded far exceeds the area rehabilitated. Unless massive efforts are made to mobilise farming communities, the march of degradation cannot be contained. This would, however, require the development of cost effective and easily adaptable packages linking conservation and production to motivate farmers. High cost and questionable performance of mechanical measures have also shifted emphasis on biological measures of land amelioration. It is planned that 40 mha of wastelands be developed with vegetation models designed for each agro-ecological region integrating multi purpose trees and sod-farming, conservation effective perennial grasses having inherent ability to thrive on degraded sites and provide usable biomass and economic returns.

In the Himalayan foot-hill ecosystem of north India, *Acacia nilotica* is the most favoured multipurpose tree species, Bhabar *(Euloiopsis binata)* and kana *(Saccharum munja)* are important sod forming natural perennial grasses. Dub grass *(Cynodon dactylon)* also commonly thrives and meet conservation and forage needs. Vetiver grass *(Vetiver zizanioides)* occurs naturally in wet pockets and was strongly recommended in many of the internationally funded projects on conservation of natural resources. The research information on the integration of these remarkable plant species in a silvipasture system was lacking. Hence the study.

In a replicated and randomised field experiment started in July 1990 on a 1.2 ha of degrade gravelly soil near Chandigarh (30°-45' N, 76 ° -15' E, 350 m MSL) typically representing semi-arid climate; *Acacia nilotica* was uniformly planted from nursery raised tube plants at 8x5 m spacing in 30 cm^3 pits. Four understorey grasses namely Bhabar, Vetiver (0.5x0.5 m), Kana (1x1 m), natural dub grass were raised in the interspace and compared with control having no grass. Interplot earthen bunds of 20 cm height were made to conserve rainwater. Runoff and soil loss was measured using Ramser samplers. The root system of the 3 planted grasses was studied by excavating soil monoliths at one and two years of age. Grasses were harvested twice a year in June and November and air dry weights recorded.

All the four understorey grasses affected the survival (except Vetiver) and growth of *Acacia nilotica* seedlings as compared with no grass treatment (Table 1). The depressing effect amongst grasses were non-significant. All grasses tended to reduce runoff and hence soil loss. The lowest water loss (2.2%) was recorded under natural grass followed by planted Vetiver grass (5.8%). The residual soil moisture left in 0-30 cm soil profile at harvest was highest (9.1%) in Vetiver grass. *S. munja* provided the maximum biomass when Bhabar and Vetiver were almost at par. The roots of Kana were relatively more sturdy and thick but the root density was low. The roots of Bhabar and Vetiver grass were more fine, spongy, larger in number and hence their root density was much higher. The results of 3 years of study indicated that Vetiver was more conservation effective, Saccharum gave more biomass and Bhabar grass provided more of economic returns. The emergence of clear picture about their relative merits would take few more years of study.

Table 1. Effect of some understorey grasses, on tree growth, and their conservation and production potential.

Treatments of understorey grasses	Acacia nilotica*			Water conservation**		Production potential Air dry grass yield (t ha^{-1})			Root characteristics		
	Survival (%)	Collar dia. (cm)	Height (cm)	Runoff (%)	Residual moisture (%)	1991	1992	1993	Mean root diameter (mm)	Length per gram of root mass (cm)	Root density $Km.m^3$ of soil
Dub grass	85.2	3.2	211	2.2	7.0	3.16	4.11	2.73	-	-	-
Bhabar	86.5	3.4	242	14.7	6.6	1.07	5.08	6.06	0.89	340	9.53
Vetiver	93.7	3.2	218	5.8	9.1	0.48	7.76	6.70	1.04	423	6.90
Kana	89.3	3.5	239	13.7	8.2	0.20	9.54	14.01	1.79	76	0.89
No grass	93.7	7.2	364	27.1	8.4	-	-	-	-	-	-
LSD 0.05	NS	0.9	43				1.31	1.47			

* At 30 months age.

** With 717 mm of monsoon rainfall of 1992.